Competitive market structures and exclusive licensing[1]

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This is an exercise in deductive modeling that proposes a solution to the problem of adjudicating patent licenses when the aim is maximizing competition without neutralizing the profit incentive necessary for large investments in product development.

Background

The legal doctrine of intellectual property rights (IPRs) has been predicated largely on the basis that the profit incentive is a necessary condition for private investment in innovation. Furthermore, public funding of scientific research, particularly research not inspired by use or application, has been justified asserting that the profit incentive is not sufficient to induce investment in research. These are the two dominant ingredients of innovation policy: government funding of research and patent law.

A third element of innovation policy is concerned with the institutions (including laws and organizations) governing the development of abstract scientific findings into useful technologies–the former being generally supported with tax money and the latter chiefly commanded by the private sector. Transferring knowledge from the public to the private domain is at the core of these institutions, and yet the first three decades of post-war innovation policy lacked of a unified federal policy regarding intellectual property of discoveries made, totally or partially, with public funds. The funding agencies had exercised their discretion over the full range of possibilities, from asking research contractors to forfeit all claims over their inventions to granting them full ownership (albeit subject to strict conditions). This institutional uncertainty about the property of publicly funded discoveries was blamed for the underutilization of research findings. Without clear property rights and guarantees of substantial returns, the argument goes, industry has no incentives to invest the large sums needed to develop promising scientific findings into commercial products. This rationale inspired the Stevenson-Wydler Act (P.L. 96-480) and the Bayh-Dole Act (P.L. 96-517), both enacted by the US Congress in 1980. The fundamental reform introduced by this legislation was to allow research contractors, primarily universities and national laboratories, to claim ownership of their discoveries.

The debate about exclusive licensing.

A key aspect of this legislation (particularly as amended in 1984, P.L. 98-620) is allowing universities and national laboratories to license their patents on exclusive basis. Skeptical observers point out that, by allowing the formation of monopolies, the government is subsidizing high-tech companies and exacting twice consumers who paid taxes to fund research and then have to pay higher monopoly prices to acquire new products. Detractors of exclusive licenses point to escalating prices for products with inelastic demand such certain pharmaceuticals and

[1] Article to be presented at the Atlanta Conference on Science Innovation Policy, 2009.

medical treatments. Advocates of exclusive licensing insist, in turn, that without the promise of monopolistic profits technological advancement would slow down if not stall, especially in sectors such as healthcare.

A definitive solution to this debate is elusive for several reasons. First, a plausible counterfactual is hard to produce when evaluating whether exclusive licensing was necessary to motivate investment. For instance, responding to the "what if" question, an ex-post commercial success that overestimated the risk of failure ex-ante investment, we can plausible conclude that "investment would not have occurred" if we find that every other investor assessed risk similarly, or equally reasonably argue that "investment would have occur in any case" because the expected returns were also inflated. Second, this is a research question with a strong trade-off between generalizability and validity. As we split the universe of monopolies to adequately reflect the unique mix of conditions in each industry, and each market, and each monopolist cost structure, conclusions become increasingly anecdotal. This methodological difficulties are bound to fuel further acrimony in this debate as partisans of one or other perspective react overly critical to falsifying evidence and under critical to supporting case studies.

An auction to induce competition.

Drawing from economic literature in contract design it is proposed here a characterization of the university problem. In the current institutional setting, universities maximize licensing income. In contrast, in scheme proposed below, the objective function of the university is to maximize the number of firms willing to develop a patented discovery.

The contract is determined by means of auctioning licenses to the use of a patent. The bidders in the auction must disclose two figures. The first number is the maximum size of market competitors before expected returns for the bidder outweigh the costs of investing in developing a commercial product (N). The second figure is the maximum royalty the firm is willing to pay if the university grants a license to N firms (R). R is simply the net present value of all royalty payments to the university during the life of the patent; R represents the valuation of the license in a market of N competitors. The suggested auction is a multi-layered second price sealed bid auction that introduces an incentive to the firms to bid their true valuation at their maximal tolerance for competition. Comparative statics are discussed for this auction when the probability distribution of expected profits is homogeneous across firms, as well as the case where the distribution is heterogeneous, varying with knowledge of the relevant technology (i.e. absorptive capacity) or ability to penetrate a market niche (e.g. geographical advantage).

An appealing aspect of this auction is that if offers a de facto response, on a per patent basis, to the debate as to whether exclusivity is a necessary condition for investment. Whereas the low hanging fruit will attract heavy competition, patents that require many years of development before they materialize in a commercial reality will only attract monopolies.

Furthermore, the analytical solutions derived here could be tested in a laboratory introducing participants to a betting game where payouts are distributed to the winning bids following the rules of this auction. The policy prescription is clear if this mechanism is ultimately shown to be effective in conditions that approximate the complexity of the patent licensing market.

The auction

The licenses are granted according to the following rule:

1. Bids are organized in groups, where group-K has all bids with N≥K. For instance a bid duple (N, R) equal to (10, 100) is considered for all K groups 10 through 1 since it is evident that a firm willing to compete with other 9 and pay 100 is surely willing to be a monopolist and pay 100.
2. Bids in each group-K are rank ordered along R levels. In the example above, (10, 100) is ranked higher than (1, 90) in the K=1 group even if it was that (1, 90) was the highest bid of all N=1 bids.
3. The bid with the highest R in each group is dropped. It is well known that the optimal bid in a second price sealed bid auction is the true valuation because it penalizes speculators shortchanging their bids. This is to prevent attempts to play the system by bidding high N and high R simultaneously. In the example above, (10, 100) losses in the K=1 group to (1, 90).
4. Let leader-K be the second highest R bid for each group-K.

Alternative A

5. The university grants licenses to the leader-K of the largest fully populated or dense group-K (i.e. a group-K with K bids) and to each K–1 top bids under the leader-K. Each firm pays its bid.

Alternative B

6. The university publishes anonymously the bids of all group-Ks with higher or equal K than the largest dense group-K up to the number of remaining participants. For instance, with 10 firms participating in the auction, all bids all groups larger or equal than the largest dense group-K all the way to group-10 are listed.
7. Then, firms are invited to improve their bids but they cannot withdraw from the auction. Firms that do not review their bids are automatically re-entered with their original bid.
8. The university grants a license to the leader-K of the largest dense group-K as selected in first round, and grants a license to each of the K–1 top bids under that leader-K. Each firm pays its bid.

Additional variants

The university could give priority to the top K–1 bidder who match the leader-K's bid (in the dense group-K). This could be an additional incentive for firms that honestly bid their true valuation in the first round to adjust their expectation in the second round but have their 'seats reserved'. In the absence of the 'seats reserved' rule, the firms would have the incentive to review their estimates and increase N (given R is equalized to the leader's) up to the point where the marginal unit of N drives the expected net return to zero.

When a single bid is presented for a Group-K, the K-leader is that single bidder if it is also the K-leader in the (K–1)-group, or if the (K–1)-group has a bid lower than its bid in the Group-K (and is entered at such a lower bid). In this way, the bid of the K-leader can only be lesser or equal to the bid of the (K–1)-leader.